

THURSDAY, APRIL 26, 1894.

BIOLOGY AT THE ANTIPODES.

The "Macleay Memorial Volume." Published by the Linnean Society of New South Wales. (London: Dulau and Co., 1893.)

THE "Macleay Memorial Volume," dated September 1893, is a handsome work of 308 pp. quarto, with 42 plates and woodcuts. It contains a biography, by the editor, Mr. J. J. Fletcher, Secretary of the Linnean Society of New South Wales, with an accompanying portrait, and a series of thirteen representative memoirs, which deal chiefly with certain indigenous worms, molluscs, crustaceans, fishes, and mammals. Botany and vegetable palæontology are duly represented; and the claims of anthropology as a branch of biological science are rightly recognised, in the incorporation of an article by Mr. R. Etheridge, jun., on a series of exhibits forwarded by the Commissioners for New South Wales to the Chicago Exhibition of last year. The class Aves is, curiously, unrepresented; and we could have wished that Prof. Parker's revisionary monograph of the Dinornithidæ might have been reserved for its pages.

The project, which is commemorative of the work of the man who, as the scientific world knows well, has done more than all others for the furtherance of biology at the antipodes, emanated with Prof. Haswell, of the Sydney University, himself a contributor of two of the most important monographs, and it was carried into effect by a small committee, of which he and the editor were members.

William Macleay was born at Wick in 1820, and educated at the Edinburgh Academy. He emigrated in 1839; and, after spending fifteen years as a squatter, and thirty-five as a politician (serving under seven successive parliaments), he retired, to devote the rest of his life wholly to biology. As a politician he appears to have been neither a mere jobber nor an office-seeker, and he will be long remembered as the friend of the inland districts, and the foremost advocate of railway extension. The connection of his family with scientific progress in Australia is now historical; his own work in the same field dates from the year 1860. His entomological collection, originally associated with the foundation of the Entomological Society of New South Wales, became in time the nucleus of the Macleay Museum, which has now reached famous proportions. Having founded the Linnean Society of New South Wales, he proceeded to develop it, chiefly in association with the labours of a personally equipped and conducted expedition to the north-east coast of Australia and New Guinea, in the working out of the results of which he was materially assisted by others whose latent enthusiasm and abilities he aroused by his influence and example. The purchase and presentation of the Linnean Hall, to make good the loss by fire of its predecessor, the Garden Palace, set the seal to his life's labours, his total benefices being estimated at a value of £100,000. His work for the University has since his death entered upon a new phase, by his having bequeathed the sum of £12,000 for the endowment of a chair of bacteriology, and one of

£35,000 for that of four research fellowships in natural science, open only to members of the Sydney University, on the condition that they reside in New South Wales and publish their work in its Linnean Society's volumes. The energy and enthusiasm of professional workers in biological science at the antipodes is now sufficiently evident, although perhaps insufficiently recognised at home; and that of more private inquirers, such as is associated with the names of Bracebridge Wilson, Chilton, G. M. Thomson, Maskell, and others, has been already productive of most interesting and important results. The "Linnean Macleay Fellowships," indeed worth the having, cannot fail to inspire investigations of a high order; and owing to the conditions of their tenure, they must ever remain peculiarly suggestive of a welding together of the highest aims of their founder, in a manner destined to keep his memory green. Zoology is especially favoured; and the great desideratum of the moment is the fuller cultivation of the botanical field, which is wide enough for an army of workers, and, in consideration of the localisation of the various climatic conditions under which the colony is placed, must abound in treasures perhaps undreamt of. The investigation of this on broad morphological lines is imperative.

The first monograph which the volume contains is by Prof. Spencer, "On the Blood-vessels of *Ceratodus*," and he incidentally records some observations upon the habits of that animal. His confirmation of Günther's discovery of its vena cava inferior, and that of its pulmonary artery, of its anterior abdominal venous system, of its circulus cephalicus, and of the origin of its hyoidean artery from the first efferent branchial, are all of intense interest and very welcome, especially in anticipation of Prof. Semon's work upon the development of the fish, now progressing. This is followed by a monograph upon the "Pliocene Mollusca of New Zealand," by Prof. F. W. Hutton. Prof. Haswell contributes a "Revisionary Monograph of the Temnocephalæ," in extension of his well-known work upon the type genus; and it heightens the interest in these anomalous animals at all points. The discovery of a ciliated integument and of other features of a unique order for the Trematoda, leaves him still in doubt as to the affinities of these worms, and of an equally remarkable proboscis-bearing ally (*Actinodactylella*), leading the life of a scavenger on the burrowing crayfish, *Engaus fossa*, which he describes as new. Not the least generally interesting of Prof. Haswell's incidental discoveries are those of the behaviour of the Temnocephalan in relation to the surface film of water, of the presence of a series of ciliary flames within the substance of a single cell, and of the apparent passage of chromatic substance into the tail of the developing spermatozoon. Prof. Parker and Miss Rich contribute an elaborate monograph upon "The Myology of the New Zealand Sea-Crayfish (*Palinurus Edwardsii*)," and it is in the spirit suggestive of Dr. Johnson's famous remark that easy reading is precious hard writing. The discovery that Milne-Edwards' flexor abdominis is in part an extensor is apparently perfectly sound; and that of vestigial muscles in relation to the bases of the antennules and their sterna with which they are continuously calcified, is particularly welcome,

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as it opens up new possibilities of approaching difficulties now arising in certain quarters, as to the exact interpretation of parts of the arthropod body where similar fusion is effected. Messrs. Wilson and Martin contribute a couple of papers on "The Muzzle of Ornithorhynchus," and inform us that the beak of that animal is in life "no more horny than a dog's nose." They show that Turner's "fibrous membrane" is really a cartilaginous tract, and that the immense pre-nasal cartilage is the inter-trabecular one of Parker, highly specialised. Their observations on the "rod-like tactile organs," which Poulton first described and discussed in their exquisite bearings on the functions of end-organs of the Pacinian type, appear on the whole unsatisfactory, in consideration of their having worked upon fresh material. Their illustrations are crude, and they do not seem to have made the most of their preparations. Then follows a paper by Mr. C. Hedley, on the aberrant gasteropod *Parmacochlea*, and one by Prof. Ralph Tate on the "Geographical Relations of the Floras of Norfolk and Lord Howe Islands," in which he concludes that the latter are to be regarded as outliers of the New Zealand region. Baron von Mueller contributes two papers on systematic botany, and Mr. R. Etheridge, jun., one, already alluded to, upon "Some Implements and Weapons of the Alligator Tribe, Port Essington, North Australia." The series closes with a monograph of 51 pages, by Mr. W. A. Cobb, on "Nematodes, mostly Australian and Fijian," in which eighty-two species (half of which are new, and many of which are European) are worked out, in relation to a plan under which the unit of measurement equals the 1-100th part of the worm's length, and certain longitudinal and transverse measurements, taken at points which mark the disposition of leading organs and apertures, are ingeniously formulated for ready comparison.

Such is the scope of the volume, and we congratulate the committee upon it. So far as the editor is concerned, there is internal evidence of the great labour of his task, and that its execution has been to him a labour of love. When it is considered that during the compilation of a work so costly and unremunerative, the country lay under a sore financial depression, we earnestly hope that the meagre list of subscribers announced within its covers will be supplemented by a number sufficient for adequate repayment.

The illustrative plates are somewhat unequal in merit, those of the Photoline Printing Company being in particular not a little crude and muzzy. We note, however, with intense satisfaction, the work of a native lithographer, Wendel by name. Anything more satisfactory than his draughtsmanship it is difficult to conceive; and illustrations such as those numbering pl. xi., fig. 9, and pl. xiv., fig. 1, betoken, on his part, artistic feeling (*Geist*) of a high order, and, on that of the printer, manipulative skill worthy the highest encouragement. For the "discovery" of this artist Prof. Spencer has to be thanked; and it is not a little irritating to us at home that it should have remained for our antipodean *confrères* to first reach that standard of excellence in scientific illustration which, in association with the well-known names of certain continental lithographers, has been so long the admiration of the biological world.

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The contents of the volume, when broadly estimated in correlation with the work which the Australasian biologists have during the last decade made public, amply testifies to a determination on their part to leave the study of histogenesis and the refinements of microscopy to us at home, in preference for the monographing of their indigenous fauna and flora, along those broader lines upon which the great problems to which they hold the keys must be solved. The resolution is as wise as it is noble on their part, and in adopting it they are unquestionably furthering the foremost desires of the generous and far-sighted man whose pioneer's work they have so successfully combined to memorialise.

G. B. H.

HARMONIC ANALYSIS.

An Elementary Treatise on Fourier's Series, and Spherical, Cylindrical, and Ellipsoidal Harmonics, with Applications to Problems in Mathematical Physics. By W. E. Byerly, Ph.D., Professor of Mathematics in Harvard University. (Boston, U.S.A.: Ginn and Co.)

THIS treatise contains, in an expanded form, the subject-matter of a course of lectures by Prof. Byerly, on the functions mentioned in the title. The properties of the functions are developed, to a large extent, by means of special examples of their application to obtain solutions of problems involving the differential equations of physics. The object of the treatise appears to be rather to give examples of the practical applications of the functions, than to develop in detail their analytical properties; many important theoretical points are accordingly passed over, the results of investigations being in many cases merely stated. In the introductory chapter the functions of Legendre and Bessel are introduced by means of some of the simpler differential equations of physics. As a matter of method, we think it might have been better to have referred all the functions to Laplace's equation in the first instance, leaving the cases of the equations of heat, vibrations, &c. for subsequent treatment; thus, for example, the circular and exponential functions, spherical harmonics, and Bessel's functions should make their first appearance in the *normal forms*,

$$e^{\pm \sqrt{m^2 + n^2} z} \frac{\cos mx}{\sin mx} \cdot \frac{\cos ny}{\sin ny}, \quad r^n \frac{\cos m\phi}{\sin m\phi} \cdot P_n^m(\cos \theta), \\ e^{\pm kz} \frac{\cos m\phi}{\sin m\phi} \cdot J_n(k\rho),$$

which satisfy the equation

$$\nabla^2 V = 0.$$

The least satisfactory part of the book appears to us to be the treatment of Fourier's series in chapters ii. and iii.; it is neither desirable nor possible in an elementary treatise to give a complete discussion of the various points which arise in such a subject as the expansion of arbitrarily given functions in series of circular functions, but it is eminently desirable that it should be distinctly pointed out whenever a result is obtained by a method which falls short of demonstration, and the nature of the assumptions made, should as far as possible be indicated. If this is not done, the student is misled into thinking